

REMARKS

By the present amendment, claims 1 and 4 have been amended to obviate the examiner's objections thereto and/or to further clarify the concepts of the present invention. Entry of these amendments is respectfully requested.

In the Office Action, a substitute specification in proper idiomatic English and in compliance with 37 CFR 1.52(a) and (b) was required. Enclosed please find a substitute specification as well as a marked-up version of the substitute specification. It is submitted that the substitute specification contains no new matter.

Claim 1 was objected to because of noted informalities apparently with respect to the use of the phrases "separate and recover" and "second solution for separation" 1 being unclear. As to the former, the suggestion of the examiner has been adopted. As to the latter, the use of the phrase "residue solution" has been adopted throughout the claim, the various solutions being identified by "first," "second" and "third" for further clarity. Withdrawal of the objection is requested.

Claims 1-8 were rejected under the second paragraph of 35 U.S.C. 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Reconsideration of this rejection in view of the above

claim amendments and the following comments is respectfully requested.

As mentioned above, claims 1 and 4 have been amended herein to, among other things, obviate the examiner's objections thereto. It is submitted that all of the claims are now in full conformance with the provisions of the cited statute. Accordingly, withdrawal of the rejection under the second paragraph of 35 U.S.C. § 112 is respectfully requested.

Claims 1-8 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hubred in view of the patents to Veal and Nalewajek et al. In making this rejection, it was asserted that the Hubred patent discloses a process comprising a step corresponding to the leaching step of claim 1, wherein a portion of the residue solution is added to ammonia-containing leaching water. It was acknowledged that the Hubred patent does not disclose a step of adding ammonium orthomolybdate to separate and recover deposited ammonium metavanadate, but it was asserted that the patent to Veal teaches this step. It was further acknowledged that the Hubred and Veal patents do not disclose the addition of the water-soluble alcohol, but it was asserted that the Nalewajek et al teaches adding a water-soluble alcohol to separate and recover ammonium orthomolybdate. Reconsideration of this rejection in view of the above claim amendments and the following comments is respectfully requested.

Before discussing the rejection in detail, a brief review of the presently claimed invention may be quite instructive. The subject invention as defined by independent claim

1 relates to a process for separating and recovering valuable metals such as vanadium and molybdenum from materials such as used catalysts. Particular features of the subject invention include the following:

- (1) Ammonium values used as a sole reactant material are first supplied in the form of ammonia-containing leaching water in the step (a), but once the operation of the process starts, the third residue solution allowed to remain in the step (d) is returned to step (a).
- (2) Ammonium orthomolybdate which is used as an extractant is first supplied to step (b), but once the operation of the process starts, the ammonium orthomolybdate is returned to step (b).
- (3) A water soluble alcohol which is used as an extractant for depositing ammonium orthomolybdate is first supplied to step (c), but once the operation of the process starts, the added water soluble alcohol is recovered and returned to step (c).
- (4) Only deposited ammonium metavanadate and ammonium orthomolybdate are discharged from the process.

In the process of the present invention, the recovery of the valuable metals is conducted with a simple and compact apparatus in which no chemicals except ammonia

for reacting with valuable metals are used and thus no by-products are generated. Therefore, there is no need for facilities for treating such by-products, which results in significant and remarkable economical advantages over conventional methods. It is submitted that a process as presently claimed and the above features thereof are not taught or suggested by the cited Hubred, Veal and Nalewajek et al patents whether taken singly or in combination.

The patent to Hubred apparently relates to the recovery of metals from spent hydroprocessing catalysts, in particular those containing nickel, cobalt, molybdenum and vanadium, by leaching with an aqueous leach solution of ammonia and an ammonium salt. The vanadium and molybdenum are then extracted using quaternary ammonium compounds as extractants in an organic solution and then the metals are stripped from the organic phase into an aqueous phase by an aqueous solution of bicarbonate or carbonate solutions or other anion.

The patent to Veal apparently discloses a process to recover metals from a spent catalyst where the catalyst may contain molybdenum and vanadium by leaching in a "caustic leach" of pH greater than 9. In the recovery of vanadium and molybdenum species, the caustic leach is subjected to liquid-liquid ion exchange involving an organic solvent containing an extractant such as an amine, which binds the metals. The metal-containing organic solvent is then sent to a stripping circuit, where the organic phase is

contacted with an aqueous ammonium molybdate solution. The vanadium is recovered by adding ammonium hydroxide to precipitate ammonium metavanadate. A portion of the liquid stream is stripped to remove ammonia and the pH is lowered to 2.5, precipitating ammonium molybdate.

In the rejection, it was asserted that the Veal and Hubred patents can be combined by:

“[substituting] the vanadium precipitation step of Hubred with a step of **adding ammonium orthomolybdate** to the leached solution to separate and recover the deposited ammonium metavanadate from a first solution for separation of the vanadium in view of the teaching of Veal. The suggestion or motivation for doing so would have been to selectively precipitate the ammonium metavanadate (Column 6 [of Veal]).” (Office action, page 4, 2nd paragraph, emphasis added)

That is, it was asserted that the catalyst be leached with an ammonia/ammonium salt solution as in the Hubred patent, and that then, instead of extraction with a quaternary ammonium compound and an organic solvent, ammonium orthomolybdate can be added.

It is submitted that such a combination is not tenable for at least several reasons. First, both the Hubred and Veal patents teach extraction with an organic solvent as the step following the original leaching step. Furthermore, the Veal patent teaches that ammonium molybdate is contacted with the ***metal-containing organic phase*** (column 5, line 50) ***after*** the addition of the extractant. In addition, this contact results in extraction of Mo and V "into the aqueous ammonium molybdate solution," and does not result in precipitation of any species until the pH is increased by addition of ammonium hydroxide (column 5, line 55).

It therefore is submitted that the combination of the teachings of the two patents as proposed in the Action would be as follows: 1) leach with ammonia/ammonium salt; 2) extract with quaternary ammonium salt/organic solvent; 3) extract with ammonium molybdate solution; 4) add ammonium hydroxide to precipitate ammonium metavanadate. This resulting combination ***is completely different from the process as recited in claim 1*** and thus no *prima facie* case of obviousness has been made.

It is further submitted that the above noted teaching deficiencies of the Hubred and Veal patents are not supplied by the cited Nalewajek et al patent. The Nalewajek et al patent discloses separation and recovery of molybdenum values from uranium process waste containing uranium hexafluoride, molybdenum hexafluoride and molybdenum oxytetrafluoride. In the disclosed process, the waste is hydrolyzed in an aqueous solution

of ammonium carbonate and ammonium hydroxide, and digested at 60 to 80 °C to drive off carbon dioxide, resulting in ammonium diuranate, with the molybdenum values staying in solution. The filtrates are eventually diluted with ethanol to precipitate ammonium molybdate.

Although the Nalewajek et al patent apparently does teach that ammonium molybdate can be precipitated from ammoniacal solutions by use of ethanol, there is no teaching or suggestion in this patent to use ethanol precipitation at any particular step in a process according to the Veal or Hubred patents. Moreover, in both of these latter patents, molybdenum and vanadium are extracted into an ***organic phase*** with an extractant, this organic phase according to column 5, line 64 of the Hubred patent, for example, may be decanol. Therefore, it is submitted that adding ethanol at this stage would almost certainly not precipitate anything, and such a combination of the teachings would not operate as proposed in the Action.

For the reasons stated above, withdrawal of the rejection under 35 U.S.C. § 103(a) and allowance of claims 1 through 8 as amended over the cited patents are respectfully requested.

In view of the foregoing, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

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OA dated May 5, 2006
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In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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Enclosures: Substitute specification; Marked-up version